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Variation in three populations of *Capromys pilorides* (Rodentia: Capromyidae), and the description of a new subspecies from the south of the Isle of Youth (Cuba)

by
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Abstract: External morphological cranial and genetic-biochemical characters of three populations of conga hutia (*Capromys pilorides*) have been examined. Ecological, ethological, pelage and habitat aspects were also considered. Comparison of populations of the nominate subspecies in the Ciénaga de Zapata, and populations from the north and south of the Isle of Youth (Cuba) contributed to clarifying the taxonomic status of the populations from the south of this island, which had hereto been included in the subspecies *C. p. relictus* of the northern part of the isle. A detailed analysis of characters has substantiated the subspecific distinctness of the southern population of the Isle of Youth (*C. pilorides ciprianoi* ssp. n.).
Key words: morphometrics, allozymes, *Capromys pilorides*, Cuba, new subspecies.

Introduction

The conga hutia (also known as Desmarest's hutia) *Capromys pilorides*, due to its abundance and widespread distribution in Cuba, is the best studied species among Cuban hutias. It shows high ecological plasticity by living in different types of ecosystems.

Three subspecies of this hutia have been described apart from the nominate form. *Capromys pilorides gundlachianus* Varona, 1983, from the Sabana cays and islands off the northern coast of Cuba, was described mainly on the basis of its coat colour, which is almost black in some individuals. *Capromys pilorides doceleguas* Varona, 1980, from the Jardines de la Reina cays off the south-eastern coast of Cuba, was described based on external features such as the length of its tail, and some cranial characters which are considered larger than in the nominate subspecies. *Capromys pilorides relictus* Allen, 1911, from the northern region of the Isle of Youth (formerly Isle of Pines) is based on the form of several cranial characters, such as the postpalatal fossa, and has smaller values for absolute lengths than the nominate subspecies. Lastly, *Capromys pilorides pilorides* Say, 1822, is the nominate subspecies inhabiting the island of Cuba proper.

Hernández *et al.* (1987) proposed that *C. p. relictus* was restricted to the northern region of the Isle of Youth (where the type specimens were collected), since coat colour of hutias from this region differed from that of specimens from the southern part of this isle.

Such consideration, and our own observations regarding larger body size and weight of individuals from the south of the Isle of Youth, and also differences in their habits and habitat, induced us to carry out detailed research on the intraspecific status of the conga hutia inhabiting this zone.

Materials and methods

The conga hutia populations were sampled from the north and the south of the Isle of Youth and Cienaga de Zapata ("mainland" Cuba) during several expeditions from 1987 to 1989. Eighteen specimens were captured in the northern localities: Estero del Capitán, Punta Gorda, Cayo Monos, Estero del Soldado and Laguna de Pica Pica. Nineteen individuals for morphological studies and fifty for biochemical analyses were taken from the southern part of the island, in Hato de Milán, Rincón del Guanal, Carapachibey and Punta del Este. The specimens from Ciénaga de Zapata (14 for morphological studies and 30 for biochemical determination) were captured in Majagua and Molina.

External characters

Morphological characters were measured to the nearest mm with a tape measure and a vernier caliper, following Cockrum (1962): total length (TL), head and body length (HBL), tail length (LT), length of the back leg (LL), also ear height (EH). Each animal was also weighed (W in kg). The relation of the foresaid tail, ear and leg lengths to body length (TB, EB, LB, respectively) and the condition index ($K=W/TL^3$) (Davis & Hall 1951), the latter expressed in percentage, were also calculated.

Craneometric characters (56) used by Kratochvíl *et al.* (1978), and Demeter & Lázár (1984) have been measured:

Cranial measurements:

Lengths:

COND	Condylobasal
PLT	Palate
PAL	Palatilar
BPN	Basal part of neurocranium
D	Maxillary diastema
R	Rostral
MTR	Maxillary tooth row at alveole
B	Bullae osseae
N	Nasal
F	Frontal
PF	Postfrontal
HDP	Horizontal diameter of preorbital fossa
HDO	Horizontal diameter of orbital fossa
IF	Incisiva foramina
BA	Distance between bullae osseae and alveole of M^3

Widths:

Z	Zygomatic
NC	Neurocranium (with bullae osseae)
PZ	Postzygomatic
PO	Postorbital
FB	Frontal
IO	Interorbital
RO	Rostral
NP	Nasal (posterior)
NA	Nasal (anterior)
MA	Mastoid
TL	Minimal distance between temporal lines
PA	Preorbital arch
ZA	Zygomatic arch
HDF	Horizontal diameter of foramen magnum
BCO	Choana (at level of alveole of M^3)
WPA	Palate (at mid-level of alveole of PM)
WPAM	Palate (at the mid-level of alveole of M^3)
ADM	Dental arch maximum

Heights:

NEUR	Neurocranium
BU	Bullae osseae
RH	Rostral
HFI	Infraorbital foramen
OF	Orbital fossa
PF	Preorbital fossa

Heights:

FM	Foramen magnum
SHM	Skull height at mid-position

Mandibular measurements:

M	Greatest length
LM	Least length
HCO	Height of condylar process
LMA	Alveolar tooth-row length
DM	Diastema
DACO	Distance between alveoles of incisor (anterior point) and condylar process
DAIC	Distance between alveoles of incisor (posterior point) and condylar process
AHM	Anterior height
HCP	Height of coronoid process
CCD	Distance between coronoid and condylar process
CA	Distance between coronoid and angular process
COA	Distance between condylar and angular process
SC	Distance from symphysis to condylar process
SA	Distance from symphysis to angular process

Cranial volume (CV) was determined following Eisenberg & Wilson (1978). The "area" of the foramen magnum was calculated as the product of its horizontal by vertical diameters (HV).

The abbreviations corresponding to the eleven quotients of above-mentioned cranial characters analyzed are as follows: MTR/B, HFI/OF, PF/OF, ZA/PA, WPAM/WPA, M/HCO, HDP/HDO, COND/Z, M/SA, M/SC and HV.

Qualitative cranial characters were also analyzed. The different character states are given in Table 2.

Biochemical characters

Horizontal electrophoresis on starch gel, with buffer systems described in Camacho & Borroto (1989), was used to study fifteen loci genetically regulating the following allozymes: phosphoglucose isomerase (PGI), phosphoglucomutase (PGM), lactate dehydrogenase I and II (LDH), malate dehydrogenase I and II (MDH), sorbitol dehydrogenase (SDH), 6-phosphogluconate dehydrogenase (6-PGD), glucose-6-phosphate dehydrogenase (G-6PGD), glutamate oxalacetate transaminase I and II (GOT), superoxide dismutase I and II (SOD), alphaglycerophosphate dehydrogenase (-GPD) and haemoglobine (Hb).

Statistical analysis

Quantitative data were processed to obtain means and standard deviations. Analysis of variance and Duncan's tests were also carried out. Crovello's distance index was calculated between populations for the construction of dendrograms by clustering methods. Spearman's correlation matrix was used to construct dendrograms for the qualitative characters (expressed as percentages of their different states). Biochemical data were also clustered based on the genetic similarity and distance indices of Nei (1972).

Results

Comparison of external characters

Table 1 shows the statistical summary of the absolute and relative values of external morphometric characters, and weight and condition index of the three populations of *C. pilorides* examined by us. The samples from the south of the Isle of Youth, referred to hereafter as the southern form, do not differ statistically from the rest in TL, although larger on the average and reaching greater maxima than those of the subspecies *pilorides* and *relictus*. There are no significant differences in tail length among the three populations.

Table 1. Measurements of the external morphological characters and their ratios in three populations of *Capromys pilorides*

Character	*C. p. pilorides* n=14	*C. p. relictus* n=18	southern form n=19	F	
	mean±s.d. (range)				
TL	704.7 ± 59.47 (561.0 – 796.0)	693.4 ± 97.50 (620.0 – 818.0)	726.6 ± 57.82 (610.1 – 876.0)	1.75	NE
LT	217.9 ± 19.30 (143.0 – 264.0)	240.1 ± 20.92 (205.0 – 291.0)	244.4 ± 280.0 (214.0 – 280.0)	2.25	NS
HBL	476.0 ± 37.74^{b} (414.0 – 540.0)	447.8 ± 47.30^{c} (336.0 – 527.0)	482.3 ± 50.17^{a} (375.0 – 614.0)	2.86	*
EH	35.5 ± 2.64 (32.7 – 41.4)	35.5 ± 3.02 (30.0 – 40.2)	35.1 ± 4.91 (27.0 – 43.1)	0.07	NS
LL	93.6 ± 5.23^{b} (83.6 – 101.4)	97.8 ± 4.47^{a} (90.0 – 109.2)	101.1 ± 6.53^{a} (90.0 – 116.5)	7.22	**
W	3.34 ± 0.853^{b} (2.12 – 5.04)	3.51 ± 0.738^{b} (2.16 – 4.75)	4.86 ± 0.151^{a} (3.40 – 6.93)	16.31	**
TB	0.49 ± 0.07^{b} (0.34 – 0.54)	0.54 ± 0.07^{a} (0.42 – 0.66)	0.51 ± 0.58^{ab} (0.42 – 0.63)	3.94	*
EB	0.073 ± 0.005 (0.063 – 0.084)	0.076 ± 0.004 (0.069 – 0.109)	0.073 ± 0.008 (0.059 – 0.086)	1.22	NS
LB	0.197 ± 0.013^{b} (0.185 – 0.229)	0.220 ± 0.021^{a} (0.197 – 0.277)	0.207 ± 0.025^{a} (0.150 – 0.250)	4.97	**
W/TL^{3}	0.93 ± 0.18^{b} (0.70 – 1.30)	1.04 ± 0.27^{b} (0.70 – 1.50)	1.23 ± 0.40^{a} (0.90 – 1.70)	3.01	*

* $P<0.05$; ** $P<0.01$; NS – no significant difference
Letters refer to significantly different groups according to Duncan's test

Head and body length is much larger in the southern form, the difference being statistically significant. EH is similar in all three forms, whereas LL is similar for the two Isle of the Youth forms, but smaller in the subspecies *pilorides* from Cienaga de Zapata.

The southern form is the heaviest, with a mean weight statistically significantly greater than those of the subspecies *pilorides* and *relictus*. Maxima in the southern form reached 6.93 kg in our sample, although otherwise we have found individuals weighing up to 8.5 kg. Such values are rarely found in other populations of conga hutias, usually not heavier than 5 kg (unpublished data).

The ratios TB, EB and LB of the southern form do not differ statistically from the values for the subspecies *relictus*, although the southern form always has lower values since its average body length is greater. Its condition index is, however, markedly greater.

Comparison of cranial characters

Table 2 shows a comparison of the qualitative cranial characters of the three populations analyzed. Allen (1911), in his description of *C. p. relictus*, considered the postpalatal fossa to be one of the most important characters since it shows a V-shape in this subspecies as opposed to the characteristic U-shape of *C. p. pilorides* from the island of Cuba. We confirm Allen's findings. Nevertheless, the hutia samples from the northern and southern regions of the Isle of Youth clearly show that both the V- and the U-shapes of the postpalatal fossa are present in these po-

pulations. However, the frequency of the U-shape is much higher in the southern form while in the northern subspecies *relictus* the V-shape predominates. The V-shape, however, is less distinct in the southern form, since the posterior edge of the postpalatal fossa in this form and in *C. p. pilorides* never reaches the level of the anterior alveole of M^3, while in one out of five of *C. p. relictus* this point is reached, and in one out of six it is even surpassed. When this feature in analyzed in relation to the medial lingual fissure of M^3, each of the two subspecies and the southern form show a peculiar distribution of the character among individuals.

Table 2. Quantitative cranial characters of three populations of *Capromys pilorides*

	frequency(%)		
Quantitative character	*C. p. pilorides* n=14	*C. p. relictus* n=18	southern form n=19
Postpalatal fossa:			
- V-shaped	-	61.1	21.1
- U-shaped	100.0	38.1	78.9
Level of anterior edge of postpalatal fossa			
a) in relation to anterior alveole of M^3:			
- anterior to	-	16.7	-
- at same level	-	22.2	-
- posterior to	100.0	61.1	100.0
b) in relation to medial lingual fissure of M^3:			
- anterior to	28.6	72.2	15.8
- at same level	21.4	27.8	47.4
- posterior to	50.0	-	36.8
Dorsal outline of cranium in:			
a) frontal zone:			
- more or less flat	92.9	38.9	21.1
- concave	7.1	61.1	78.9
b) neurocranial zone:			
- more or less flat	7.1	11.1	52.6
- inclined	92.9	88.9	47.4
Nasal level in relation to premaxillary prolongation:			
- anterior to	85.7	16.7	63.2
- at same level	14.3	77.8	36.8
- posterior to	-	5.5	-
Position of foramen incisor:			
- at PM	100.0	22.2	5.3
- between PM and M^1	-	66.7	73.7
- at M^1	-	11.1	21.0
Jugal process level in relation to:			
a) posterior tip of alveole of M^3 in longitudinal sense:			
- anterior to	42.9	44.4	68.4
- at same level	14.2	5.6	5.3
- posterior to	42.9	50.0	26.3
b) plane formed by M^3 in vertical direction:			
- anterior to	-	11.1	26.3
- at same level	14.3	11.1	15.8
- posterior to	85.7	77.8	57.9

When viewed from the side, the top of the skull at the frontal bones tends to be concave in the southern form and in *C. p. relictus*, although more frequently so in the former. This outline tends to the flat in almost all individuals of *C. p. pilorides*. However, the outline of the neurocranium, i.e. in the parietal zone, tends to the flat in over half of the southern form, while in the other two subspecies almost all crania showed an inclination towards the basal part. In the southern form the posterior sutures of the nasal bones are behind the premaxillaries in nearly two-third of the individuals and are at the same level as these in the rest. However, in *relictus* these frequencies are 16.7% and 77.8%, while 5.5% do not attain the level of the premaxillaries. The latter character was nevertheless used by Allen (1911) in his description of *relictus*, since it is the only subspecies, of those that have been studied, where it appears.

The incisor foramen is more frequently placed between PM and M^1 in both Isle of Youth populations, although there are more individuals with this foramen at M^1 level within the southern population. In *C. p. pilorides* this position is always at the level of PM.

The jugal processes extend further than the posterior alveole of M^3 over two-third of the southern form, while in less than half of the individuals of *C. p. relictus* and half of *C. p. pilorides* this level is not even reached. This same structure, when analyzed vertically and relative to the surface of the molars, is commonly below the level of the surface of M^3 in all the forms here analyzed although the other two states of this character are found more frequently in the southern form than in the subspecies *relictus* and *pilorides*.

The southern form is the largest in a set of quantitative characters that separate it from *C. p. relictus*, such as zygomatic width, height of rostrum, length of the frontal bone, horizontal diameter of postorbital fossa, the distance between the bulla osseae and the M^3 alveole, posterior width of the nasal bone, interorbital width, horizontal and vertical diameters of foramen magnum and the height of the condylar process in the mandible (Table 3).

Table 3. Means±S.D. of cranial measurements of three populations of *Capromys pilorides*

Character	*C. p. pilorides* n=14	C. *p. relictus* n=18	southern form n=19	F	
Lengths					
COND	87.34±5.39	89.20±4.72	90.79±5.01	1.91	NS
PLT	25.71±1.94^a	23.56±1.64^b	25.17±1.38^a	7.80	**
PAL	44.44±3.36	43.81±2.42	45.66±2.60	2.14	NS
BPN	33.30±2.20	34.70±3.16	34.66±2.39	1.39	NS
D	25.49±1.86	26.31±1.78	26.69±1.54	2.01	NS
R	36.32±2.64	32.39±2.39	37.66±2.05	1.84	NS
MTR	21.68±1.11	21.34±1.21	21.52±1.50	0.26	NS
B	16.41±1.02	15.97±0.73	16.53±0.98	1.95	NS
N	28.14±2.04	28.19±2.19	28.50±2.82	0.12	NS
F	29.76±1.94^c	32.44±2.05^b	34.50±1.72^a	24.62	***
PF	36.08±2.10	35.60±2.59	37.09±2.65	1.74	NS
HDP	22.16±1.68^{ab}	21.78±2.08^b	23.28±1.64^a	3.38	*
HDO	14.12±0.93	14.08±0.69	14.30±1.00	0.33	NS
IF	10.14±0.99^b	10.98±1.65^{ab}	11.20±1.37^a	2.58	*
BA	15.47±1.45^b	16.19±1.93^b	17.79±2.32^a	6.15	**
Widths					
Z	48.06±3.61	47.08±3.73	48.33±3.08	0.65	NS
NC	32.98±1.31	33.09±1.75	34.07±2.47	1.66	NS

Table 3. cont

Character	*C. p. pilorides* n=14	C. *p. relictus* n=18	southern form n=19	F	
PZ	29.70±1.33	29.12±2.02	29.45±1.91	0.42	NS
PO	26.63±1.46	26.49±2.19	26.46±2.25	0.03	NS
FB	30.55±2.52	30.19±3.24	31.55±3.62	0.88	NS
IO	25.26±1.74^{b}	26.40±2.61^{b}	28.00±2.30^{a}	6.00	**
RO	16.73±1.10	16.91±1.69	17.49±1.65	1.15	NS
NP	10.61±0.83^{b}	11.04±1.13^{b}	11.94±1.48^{a}	5.35	*
NA	13.66±1.35^{b}	14.18±1.78^{a}	14.86±1.37^{a}	2.60	**
MA	30.86±1.74	30.81±1.76	31.70±1.87	1.41	NS
TL	3.96±1.75^{c}	7.72±1.89^{a}	5.89±2.58^{b}	12.17	***
PA	3.53±0.53	3.98±0.64	3.99±0.74	2.45	NS
ZA	10.16±1.04^{b}	10.42±0.93^{b}	11.32±1.37^{a}	4.96	**
HDF	11.51±0.63^{b}	11.29±0.71^{b}	12.55±0.99^{a}	12.63	**
BCO	5.73±0.97^{a}	5.57±0.63^{a}	4.74±1.04^{b}	6.18	**
WPA	4.45±0.45	4.42±0.60	4.68±0.69	1.04	NS
WPAM	7.62±0.77^{b}	7.81±0.55^{ab}	8.28±0.98^{a}	3.19	NS
ADM	17.76±0.93	17.60±0.86	18.03±1.27	0.77	NS
Heights					
NEUR	25.16±1.18^{ab}	26.04±2.57^{a}	24.65±1.39^{b}	2.65	*
BU	12.81±0.50	13.22±0.57	13.01±0.71	1.82	NS
RH	20.58±1.77^{c}	22.29±1.23^{b}	23.43±1.95^{a}	11.68	***
HFI	14.98±1.09	15.20±3.21	15.32±1.92	0.09	NS
OF	15.09±1.12	14.69±1.18	15.20±0.70	1.28	NS
PF	17.69±1.63	17.10±1.41	17.67±1.30	0.94	NS
FM	10.91±0.62^{b}	11.16±0.67^{b}	11.94±0.87^{a}	9.05	***
SHM	26.16±1.70^{b}	28.57±1.84^{a}	29.77±2.44^{a}	12.66	***
Mandible					
M	61.99±4.55^{b}	65.56±3.38^{a}	66.77±3.62^{a}	6.61	**
LM	44.01±2.32^{b}	46.59±2.93^{a}	48.23±2.51^{a}	10.51	***
HCD	31.19±2.53^{b}	32.96±1.44^{ab}	35.22±7.99^{a}	2.55	*
LMA	22.14±0.93	22.30±1.06	22.63±1.51	0.71	NS
DM	13.17±0.99^{b}	4.52±1.02^{a}	14.79±1.09^{a}	10.75	***
DACO	58.19±3.08^{b}	60.08±3.18^{ab}	61.86±3.43^{a}	5.18	**
DAIC	54.86±3.02^{b}	57.18±3.10^{a}	59.07±3.31^{a}	7.15	**
AHM	9.74±1.10	10.48±1.59	10.67±1.03	2.30	NS
HCP	21.73±2.02^{b}	23.04±1.65^{b}	24.64±1.99^{a}	9.73	**
CCD	21.17±1.27	21.97±1.77	21.87±1.87	0.99	NS
CA	35.23±1.90	36.26±2.44	35.84±5.27	0.31	NS
COA	26.14±1.74	27.49±1.57	27.37±2.10	2.56	NS
SA	43.31±2.33	44.03±3.04	45.13±2.10	2.01	NS
SC	47.01±2.39^{b}	48.01±2.74^{ab}	49.37±2.99^{a}	3.07	*
Volume					
CV	13.40±1.50	12.69±1.10	13.44±1.63	1.54	NS
Indices					
MTR/B	1.32±0.08	1.34±0.09	1.30±0.07	0.98	NS
HFI/OF	0.99±0.06	0.95±0.22	1.01±0.11	0.83	NS
PF/OF	1.18±0.05	1.16±0.08	1.16±0.07	0.14	NS
ZA/PA	2.90±0.28	2.67±0.45	2.88±0.38	1.85	NS
WPAM/WPA	1.72±0.15	1.78±0.22	1.81±0.21	0.81	NS
M/HCO	1.99±0.15	1.99±0.07	1.98±0.09	0.004	NS
HDP/HDO	1.57±0.14^{ab}	1.54±0.09^{b}	1.63±0.09^{a}	2.93	*
COND/Z	1.82±0.04^{b}	2.61±0.27^{a}	1.88±0.05^{b}	99.89	***
M/SA	1.43±0.08	1.47±0.08	1.49±0.05	2.46	NS
M/SC	1.32±0.06	1.35±0.07	1.35±0.05	1.54	NS
HV	125.9 ±10.10^{b}	126.20±12.80^{b}	150.00±19.50^{a}	14.96	***

NS - no significant difference; * $P<0.05$; ** $P<0.01$; *** $P<0.0001$
Letters refer to significantly different groups according to Duncan's test

The southern form is also statistically different from *C. p. relictus* in that it has the lowest values for neurocranial height and the width of choana while it has intermediate values regarding minimal distance between the temporal lines and the length of palatinum.

In general, the southern form is the largest in many quantitative characters.

A résumé of the measurements of the 56 cranial character we analyzed shows that half (28) of these are significantly different among some of the three populations; 14 (24.6%) are significantly different between *C. p. relictus* and the southern form; 22 (38.6%) between the southern form and *C. p. pilorides*, and 10 (17.5%) between *C. p. relictus* and *C. p. pilorides*. This gives an idea of the real differences existing between the southern form and *C. p. pilorides* of the Isle of Cuba, and the northern Isla of Youth subspecies *C. p. relictus*. When referring to indices, only three of these show significant differences. In the case of HDP/HDO, significant differences are due to the absolute values of HDP, since HDO values were very similar among the three forms. However, in case of the COND/Z index, while neither absolute values are significantly different, the quotient is, since in *C. p. relictus* condylobasal length is large, while zygomatic width in low. The "area" of the foramen magnum (HV) is large in the southern form, which separates it from the two other subspecies, and is thus one of its distinctive characters.

In Fig. 1a a dendrogram of the three populations based on external morphometric characters and Crovello's index of taxonomic distance is shown. *C. p. pilorides* with *C. p. relictus* is a separate group, different from the southern form. A similar dendrogram was obtained with craniometric character (Fig. 1b). The same results, not shown here, were arrived at when relative values were used.

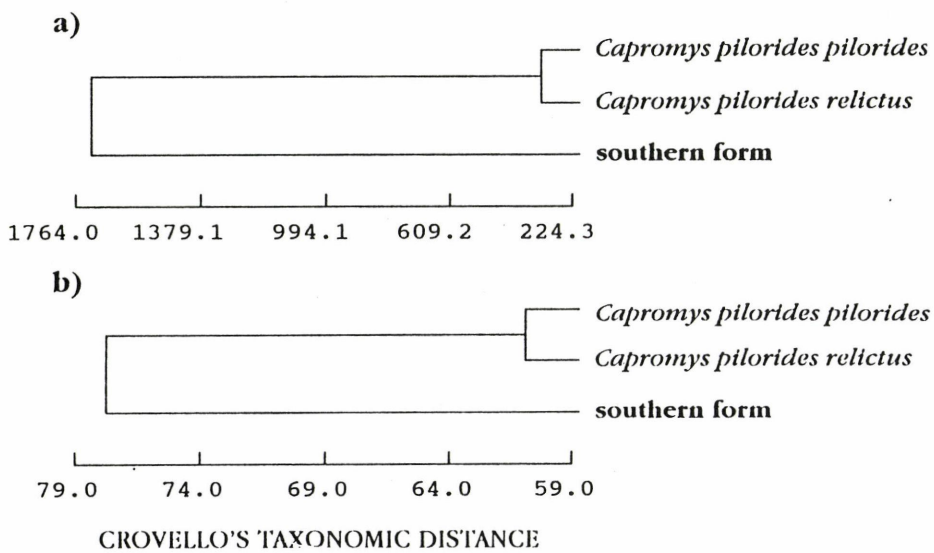

Fig. 1. Dendrograms of three populations of the conga hutia based on external morphological (a) and cranial characters (b)

A rather different picture emerged when the populations were clustered based on qualitative character and a correlation matrix (Fig. 2). The southern form is closest to *C. p. pilorides*, and removed from *C. p. relictus*.

In both methods of clustering the southern form is separate from *C. p. relictus*, the northern subspecies. Differences in the results are probably due to dissimilarity in the weight of genetic factors between the kinds of characters used for each method.

Pelage

Differences in the pattern of coat colour between the two Isle of Youth populations were also observed. The southern form tends to have an agouti coloration of the whole body. Berovides & Smith (1982) indicated that the colour pattern in this population is caused by the presence of agouti and black hair, and the total absence of white hair. In comparison, the colour pattern of *C. p. relictus* is of a lighter shade of agouti, with a grayish tone due to the presence of white hair, mainly on the head. Hernández *et al.* (1987) also referred to coat colour differences between these two populations.

Biochemical characters

In Table 4 the gene frequencies of the 5 polymorphic loci out of 15 studied are shown. There is a high similarity between the southern and northern populations of the Isle of Youth. This is especially noticeable for locus PGI. Both Isle of Youth populations have similar frequencies, which not only separate them from *C. p. pilorides* from Ciénaga de Zapata, but also from other populations from the island of Cuba where the C allele of this locus is practically fixed (Camacho & Borroto 1989). This peculiarity of the PGI locus may be interpreted in terms of one population having originated from the other, or gene exchange between these populations.

Table 4. Gene frequencies of five polymorphic systems in three populations of *Capromys pilorides*

Locus	Allele	*C. p. pilorides* n=30	*C. p. relictus* n=18	southern form n=50
PGI	C	1	0.667	0.554
	D	0	0.333	0.446
PGM	A	0.130	0	0
	B	0.870	1	1
	C	0	0	0
6-PGD	A	0.614	0.929	0.895
	B	0	0	0
	C	0.386	0.071	0.105
SDH	A	0.130	0.417	0.184
	B	0.870	0.472	0.750
	C	0	0.111	0.066
GOT-II	A	0	0	0
	B	0.413	0.639	0.557
	C	0.587	0.361	0.443

Genetic similitaries between these two populations are also evident when the similarity and genetic distance values are calculated (Table 5). Fig. 3 shows the dendrogram obtained from the genetic distance matrix, which does not sustain a separation of the Isle of Youth populations on the basis of biochemical characters alone. However, Avise (1975) indicated that allozymes are adequate for discriminating subspecies only when very marked degree of genetic divergence is present.

Table 5. Similarity index and Nei's distance index for three populations of *Capromys pilorides*

	C. p. pilorides	*C. p. relictus*	southern form
C. p. pilorides	-	0.9736	0.9802
C. p. relictus	0.0267	-	0.9958
southern form	0.0199	0.0042	-

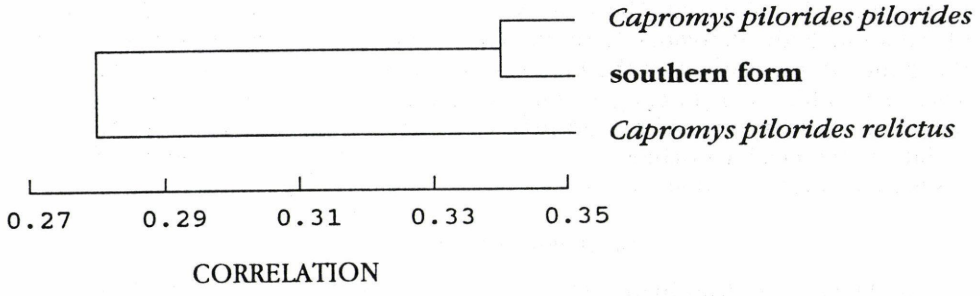

Fig. 2. Dendrogram of three populations of the conga hutia based on qualitative morphological characters

Habitat

Habitat characteristics of the southern form differ considerably from those of *C. p. relictus*. It typically lives in semideciduous forest on rocky karstic ground, with numerous "casimbas" (peculiar cavities in karstic rock) up to 1-2 meters deep (Mateo 1981). Hutias take refuge and build their nests in these "casimbas". Many adult individuals can be found in them.

Although the conga hutia is a good climber, the terrestrial habits of the southern form are obvious, since it rarely takes to trees as a refuge. These habits are correlated with the fact that of all populations of hutias studied by us, this population has the highest mean weight.

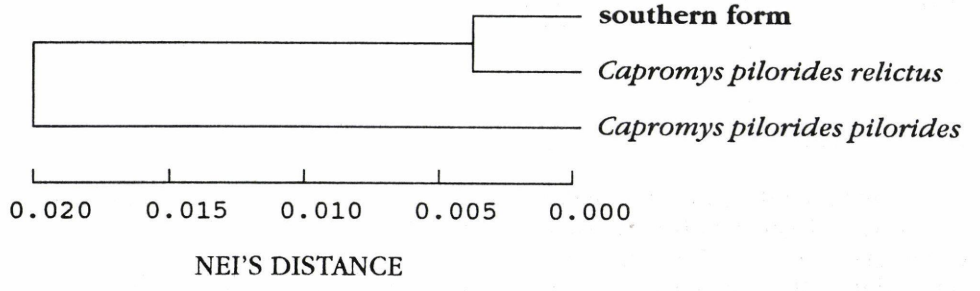

Fig. 3. Dendrogram of three populations of the conga hutia based on biochemical characters

This form may be considered as very abundant in the south, due to the fact that it is well protected by controlled and restricted access to this area and also by the diversity and abundance of resources in this habitat. The distribution of the northern form *C. p. relictus* has become restricted in recent times. It used to be quite abundant in small hills and ridges (Sierra de las Casas, La Siberia, etc.), where it lived in cliffs with hummock-type vegetation. However, at present it is mainly found in low and marshy zones and in estuaries, where the red mangrove (*Rhizophora mangle*) is predominant. There it can be found alone, in couples or with their young, among the roots and branches of mangrove. It is not abundant probably due to human influences (mainly hunting) and to the relative scarcity of food resources in this habitat.

Another important aspect is the existence of a tick which is only found among southern population of conga hutias in the Isle of Youth, described by Černy (1966) as *Ixodes* (*Alloidoixodes*) *capromydis*. The subgenus is endemic.

Distribution

From the point of view of geographic distribution, the populations of conga hutia in the Isle of Youth may be considered as two large allopatric populations, separated by the sandy lowland range bordering the large Ciénaga de Lanier swamp. This is clearly a barrier between these populations, since it is unsuitable for the species. Contact or overlap, and thus genetic exchange is only possible at the extreme eastern and western points of this area. However, in the coastal habitat of these points the northern population is quite scarce, which limits possible contact with the southern form. The northern and southern regions of the Isle of Youth have different geological histories. The northern zone is the oldest and, according to Iturralde-Vinent (1988) is constituted by folds (emerged mountain chains) formed 45 million years ago, before the early Eocene period. The southern part of the Isle, in contrast, is rather recent and of sedimentary origin. Therefore *C. p. relictus* is probably the older form from which the southern population originated. A rather recent separation would explain the similarity of these populations regarding allozyme frequencies, referred to above, especially the data for the PGI locus which differentiates the Isle of Youth populations from all other populations of the conga hutia (Camacho & Borroto 1989). Qualitative cranial characters also indicate similar tendencies, suggesting close phylogenetic relations.

However, there are also some similarities between *C. p. pilorides* from Ciénaga de Zapata and the southern form. They may perhaps indicate some kind of genetic exchange. This may be explained by the fact that both regions, Ciénaga de Zapata and the southern part of the Isle of Youth, originated practically at the same time, and communication between them might have then existed (Iturralde-Vinent 1988).

Description of a new subspecies of *Capromys pilorides*

Taking into account differences in quantitative morphological characters, habitat and other features, and the fact that Allen's (1911) description of *C. pilorides relictus* does not conform with several important traits of the population of *C.*

pilorides living in the southern part of Isle of Youth, we conclude that the latter should be considered as a different subspecies, which we hereby describe as

Capromys pilorides ciprianoi subsp. nov.

Capromys pilorides relictus:
Alayo 1958 (partim), Univ. Oriente, Museo "Charles T. Ramsden", 1-24.
Černy 1966, Poeyana: Ser A, 24:1-9.
Černy, Sixl & Waltinger 1975, Folia Parasitol. 22(2):141-143.
Capromys pilorides:
Garrido 1971 (partim), Biotropica 3(2):145-150.
Berovides & Smith 1982 (partim), Cien. Biol. 8: 49-56.
Hoogstraal & Aeschlimann 1982 (partim), Mem. Mus. Nat. Hist. Nat., Paris, S. A. 123: 157-171.
Smith & Berovides 1984 (partim), Poeyana 279:1-19.
Smith & Berovides 1984 (partim), Poeyana 280:1-20.
Hernández *et al.* 1987 (partim), Poeyana 346:1-16.
Hernández *et al.* 1987 (partim), Cien. Biol. 17:94-97.
Hernández & Sánchez 1987 (partim), Cien. Biol. 18:127-130.
Merino & Bouza 1981 (partim), Misc. Zool. 41:2.
Danielova *et al.* 1982 (partim), Acta Virol. 26:186-189.

Type. Adult male with field number 67 and collection registration number 1.518, collected by the authors on 19 January, 1989, at Punta del Este, on the south-eastern portion of the Isle of Youth, Cuba. It is deposited in the collection of the Instituto de Ecología y Sistemática, Academia de Ciencias de Cuba, Havana.

Hypodigm. The type, plus 18 skulls of male and female specimens, 4 of them accompanied by bones of posterior extremities. Nine of these individuals were collected by the authors. The material with collection numbers 1.13, 1.20, 1.21, 1.22, 1.23, 1.28, 1.29, 1.38, 1.46, 1.58, 1.518, 1.520, 1.521, 1.522, 1.523, 1.524, 1.525, 1.526 are deposited in the collection of the Institute of Ecology and Systematics, paratype accession number 11226 (original number 1.519), a female skull with partial skeleton is deposited in the Mammal Collection of the Hungarian Natural History Museum, Budapest.

Diagnosis. Postpalatal fossa predominantly U-shaped, with posterior edge at same level as alveole of M^3. Dorsal outline of neurocranium in parietal region more or less flat. Posterior sutures of nasals generally extending beyond posterior sutures of premaxillaries. Jugal processes generally extending horizontally beyond alveole of M^3. Larger than other subspecies of *C. pilorides* regarding zygomatic width, rostral height, frontal-bone length, horizontal diameter of preorbital fossa, distance between bulla ossaea and M^3 alveole, posterior nasal-bone width, interorbital diameters of foramen magnum and height of the condylar process of the mandible. Mean and maximal body weight larger than in other subspecies of *C. pilorides*, up to 8 kg. Mean head and body length and condition index greater than in other subspecies analyzed. Coat colour agouti, without white hair.

Distribution. All southern part of the Isle of Youth, including the Ciénaga de Lanier swamp, which is the northern limit of its distribution. This range includes such localities as Punta del Este, Carapachibey, Hato de Milián and Rincón del Guanal.

Etymology. The taxon is dedicated to Cipriano Amador Piñeiro, our young and excellent guide, born and raised in the southern part of the Isle of Youth, a real master in finding and capturing hutias for scientific purposes.

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